



They once returned in the spring and fall by the thousands to finish, and then begin again, a remarkable circle of life. Early settlers marveled at their strength, size, and tenacity, and labeled them the “King” of salmon. But now they only return in the fall, and their population size has declined by 85 percent since the 1940’s. Today, so few return to the Stanislaus River that the chinook (King) salmon teeters on the brink of extinction.

Their lives, marked by both tenacity and transformation, represent one of nature’s most unique journeys. A journey that spans some two thousand miles, from fresh water to salt water and back again – a journey ending where it began – perpetuating life before yielding to death.

To ensure that the circle of life continues for chinook salmon, a unique partnership has formed with the common goal of increasing the number of adults that return to spawn each year. The key to success is understanding what factors affect chinook salmon – the key to understanding is research.

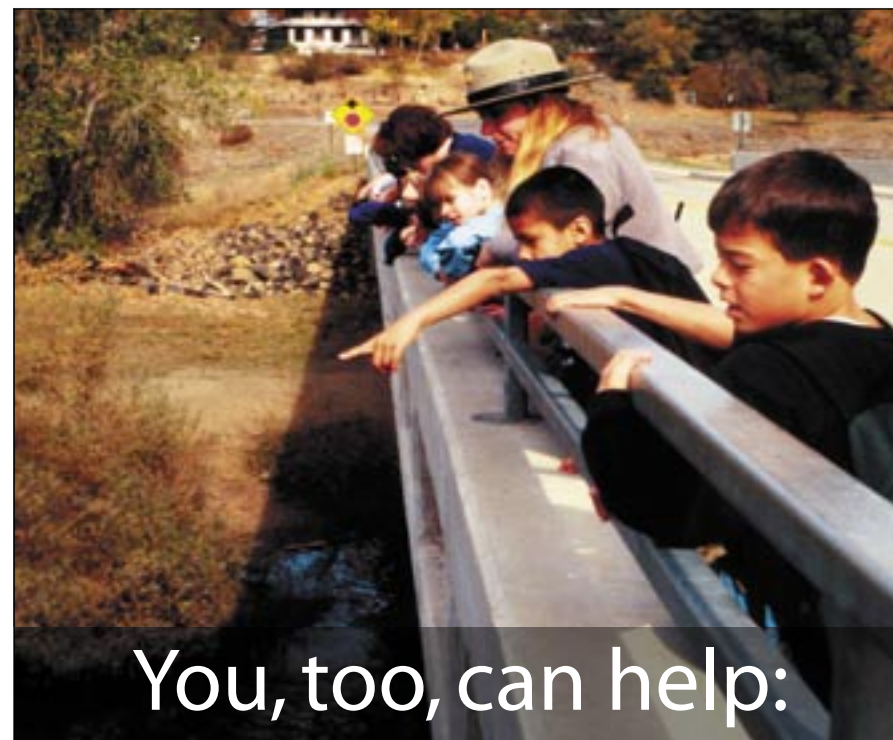


Knights Ferry is one of several sites along the Stanislaus River where research is being conducted on juvenile salmon to identify ways to help restore their populations for future generations.

This research is a cooperative effort among water rights holders, the US Fish and Wildlife Service, the California Department of Fish and Game and consulting firms specializing in salmon and trout management.

Surveys of spawning adults (“escapement”) are conducted every year. Field crews use drift boats to count spawned-out fish and to gather other biological data. Downstream of Knights Ferry, three rotary-screw traps are operated in the river to catch migrating juvenile chinook salmon.

Each day, captured fish are counted and measured, and biological data recorded. All fish are released unharmed back into the river. By collecting this information, researchers can begin to determine how and what environmental factors influence the survival of young chinook salmon and spawning success of adults.



## You, too, can help:

1. Please do not disturb any fish sampling devices found in the river.
2. Immediately report vandalism and poaching to the U.S. Army Corps of Engineers or your local law enforcement agency:

**U.S. Army Corps of Engineers**  
**881-3517**

**In an Emergency call**  
**911**

**CALTIP**  
**1-800-952-5400**

3. For answers to additional questions, please feel free to approach our uniformed staff or any U.S. Army Corps of Engineers’ employee.

**Remember, it’s up to all of us to help ensure that the circle of life is not broken.**

For More Information Contact:  
U.S. Fish & Wildlife Service  
or the  
U.S. Army Corps of Engineers

# Chinook



## Sustaining the Circle of Life



Produced by the  
U.S. Fish & Wildlife Service  
and the  
U.S. Army Corps of Engineers



**Circle of life fact:** All chinook salmon in the Stanislaus River today are referred to as fall-run, based on the time of year they enter the river. Historically however, there was also a spring-run. Spring-run chinook salmon would enter the river during spring when flows were high and it was possible to reach the upper river. Then they would spend the summer resting in deep, cold pools in the upper reaches of the river before spawning in the fall. Today, dams prevent salmon from reaching these summer pools.

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13. Once back in the Stanislaus, chinook salmon will migrate upstream to an area very near where they were born. When home, chinook salmon will find a suitable location to lay their eggs.

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12. After entering the bay, they instinctively navigate through thousands of miles of Delta channels to arrive at the mouth of the Stanislaus River.

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11. Chinook salmon generally spend 1 to 3 years growing in the ocean before they return to the Stanislaus River to spawn. Some may stay in the ocean 5 or more years.

**Circle of life fact:** Stanislaus River chinook salmon may travel thousands of miles while in the ocean, venturing as far north as Alaska and Asia.

**Circle of life fact:** Salmon populations naturally grow and shrink; depending on the environment nature provides each year. Salmon have adapted to California's variable climate. Their population naturally declines when several dry years happen together and it grows when wet years happen together. When population numbers are low after dry years, human activities can cause further declines and even lead to extinction.

**Circle of life fact:** An average redd will measure 15 square feet. Females use their tail to dig their redds in gravel that ranges in size from 1 to 6 inches in diameter.

1

1. Chinook salmon lay eggs in nests, called redds, excavated by the female.

**Circle of life fact:** It is important that the gravel is clean and free of silt and sand, which may prevent oxygen from reaching the eggs and result in their death. Salmon build their redds in fast-moving water.

2

2. After a female salmon lays eggs in the redd, one or more male salmon may fertilize the eggs.

**Circle of life fact:** Although the average female salmon lays about 5,000 eggs, some large females produce as many as 8,000.

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3. After fertilization, the female buries the eggs by lifting gravel upstream of the redd onto the eggs.

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4. Chinook salmon die after spawning, completing the circle of life. The bodies of the salmon provide nutrients to the river ecosystem to help young salmon grow.

**Circle of life note:** The time required for the eggs to hatch depends on water temperature and oxygen availability in the redd, but is generally 40 to 60 days.

5

5. When the eggs emerge, they are referred to as "alevins" or yolk-sac fry. Alevins remain in the gravel where they survive by absorbing the nutrients in their yolk.

**Circle of life fact:** Virtually all human activity along rivers affects salmon. Dams, municipal and agriculture water withdrawals, water pollution, habitat degradation, ocean harvest, sport fishing and poaching are all factors which have contributed to shrinking salmon populations.

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6. As baby chinook salmon grow, they become fry. Fry wiggle out of the gravel and move to areas with little current near shore. Fry feed on small insects and crustaceans.

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7. Young chinook salmon migrate downstream to the estuary anytime from immediately after they emerge from the gravel to after rearing over 1 year in the river.

**Circle of life fact:** The length of time chinook salmon spend in the river depends on factors including river flow, food availability, water clarity, water temperature, genetics and interactions with other fish.

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8. The majority of young Chinook salmon migrate out of the Stanislaus River in March, April and May. After salmon leave the river, they arrive in the Delta estuary.

**Circle of life fact:** Chinook salmon may spend from weeks to over a year preparing to enter the ocean.

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9. As young chinook salmon prepare to enter the ocean, they go through a physiological process called smolting. During smolting, many physiologic processes prepare them for life in the marine environment.

**Circle of life fact:** Although spring-run chinook were once the most abundant type of salmon in the Stanislaus River and the San Joaquin Basin, they have been extirpated here and now occur only in the Sacramento Basin.

## The Circle of Life Of the Chinook Salmon

Be a part of  
the circle of life:  
It is our job to ensure that these fish not only continue to survive in the Stanislaus River, but that their numbers increase to a point where we are no longer in danger of losing this magnificent fish.

